ORAL PHYSIOLOGY

COURSE CODE: 1605204

2 credit Units

SALIVARY SECRETION

Part 2

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Week 4, Lecture 1

Intended Learning Outcomes

1- To understand the Regulation of salivary secretion

2- To identify the Effects of drugs and chemicals on salivary secretion

3- Applied physiology (disorder of salivary secretion)

Regulation of salivary secretion

- Salivary secretion is regulated only by nervous mechanism. Autonomic nervous system is involved in the regulatory function.

Nerve supply to salivary glands

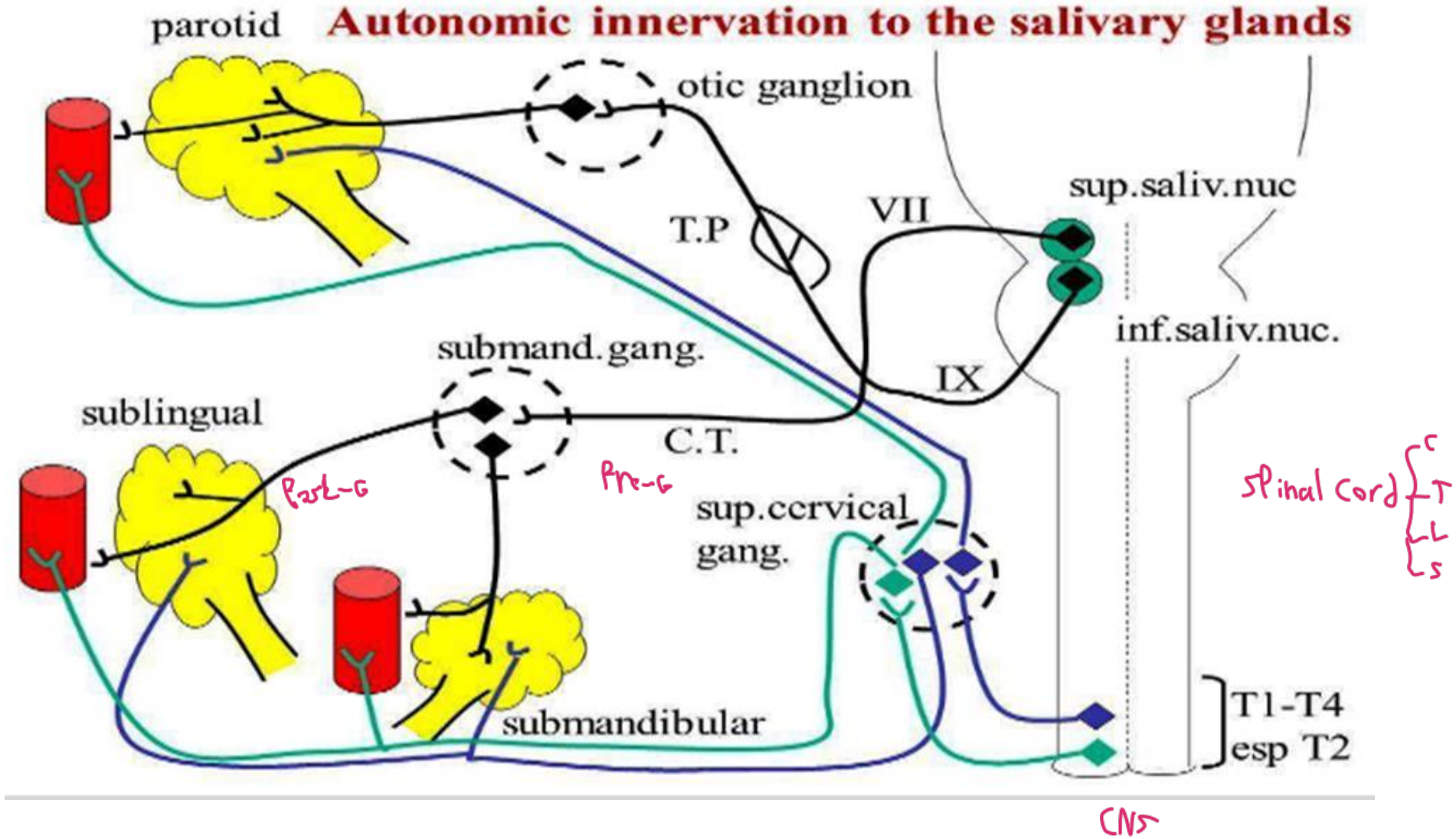
(1)Parasympathetic fibers

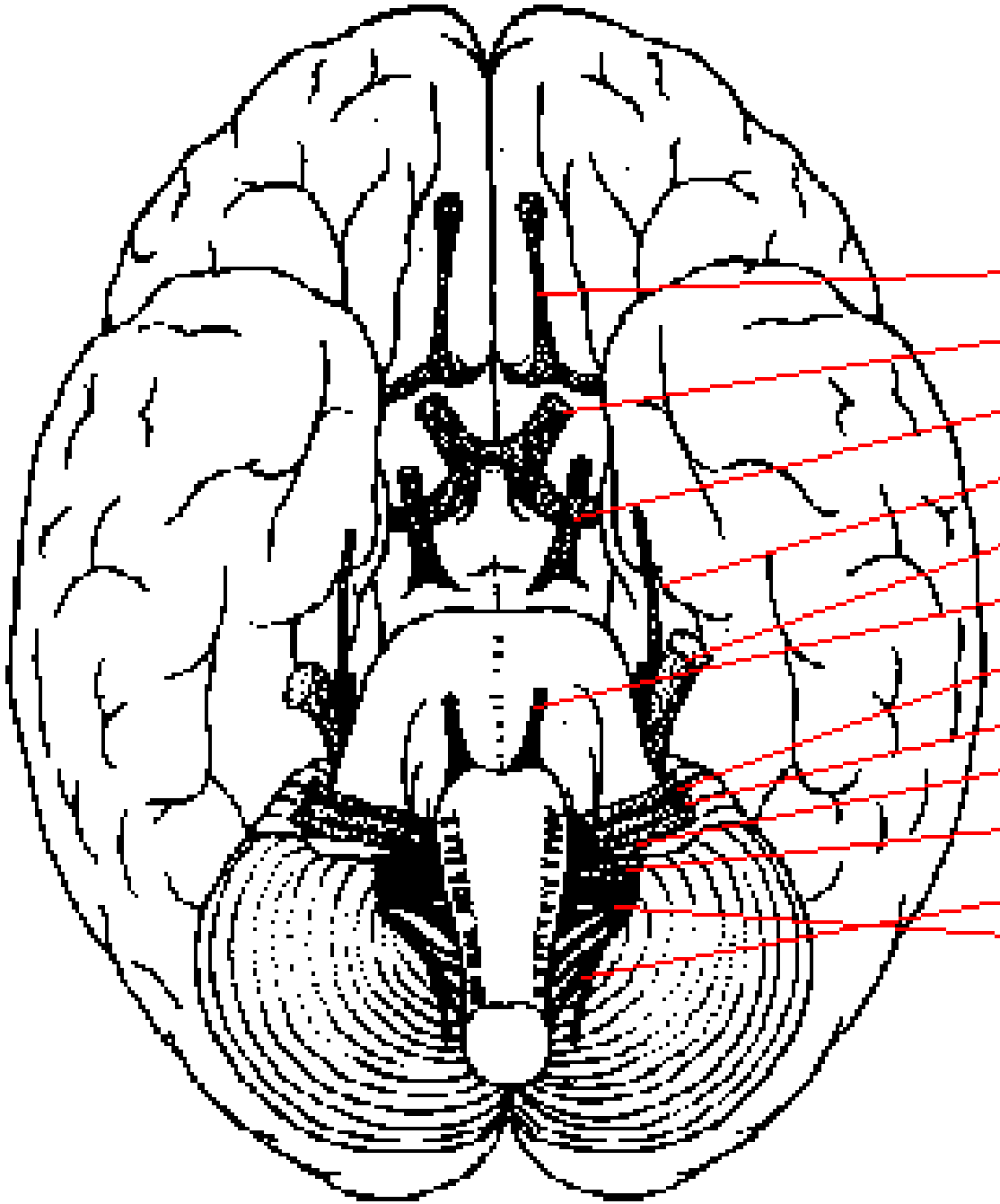
Parasympathetic fibers to submandibular and sublingual glands

- The parasympathetic preganglionic fibers to submandibular and sublingual glands innervated by ***facial nerve VII*** which arise from the ***superior salivary nucleus*** situated in pons. After taking origin from this nucleus, the preganglionic fiber reach the ***submandibular ganglion***.
- The postganglionic fibers arise from this ganglion and supply the submaxillary and sublingual glands. and supplies the BVs that supply these glands.

Parasympathetic Fibers to Parotid Gland

- The parasympathetic preganglionic fibers to parotid gland innervated by ***glossopharyngeal nerve IX*** which arise from ***inferior salivary nucleus*** situated in the upper part of medulla oblongata. From here, the fibers pass through and end in ***otic ganglion .***
- The postganglionic fibers arise from otic ganglion and reach the parotid gland . and supplies the BVs that supply these glands.


parotid
Autonomic innervation to the salivary glands
otic ganglion
T.P
VII
sup.saliv.nuc
inf.saliv.nuc.
IX
submand.gang.
sublingual
C.T.
Post-G
Pre-G
sup.cervical
gang.
submandibular
T1-T4
esp T2
CNS
spinal cord
C
T
L
S

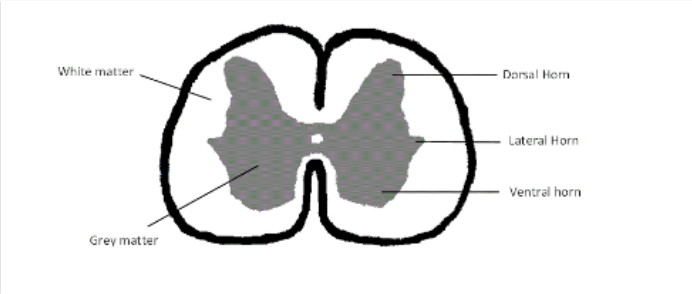


Cranial Nerve Name

I - Olfactory
II - Optic
III - Oculomotor
IV - Trochlear
V - Trigeminal
VI - Abducens
VII - Facial
VIII- Vestibulocochlear
IX - Glossopharyngeal
X - Vagus
XI - Spinal Accessory
XII - Hypoglossal

(1)Sympathetic fibers

- The sympathetic preganglionic fibers to salivary glands arise from the lateral horns of first 4 thoracic segments of spinal cord. The fibers leave the cord through the anterior nerve roots and end in ***superior cervical ganglion*** of the sympathetic chain.
- The postganglionic fibers from this ganglion are distributed to the salivary glands along the nerve plexus around the arteries supplying the glands. and supplies the BVs that supply these glands.



Functions of Parasympathetic Fibers

Parasympathetic outflow results in the release of acetylcholine (ACh) to M3 muscarinic receptors. This results in the following effects:

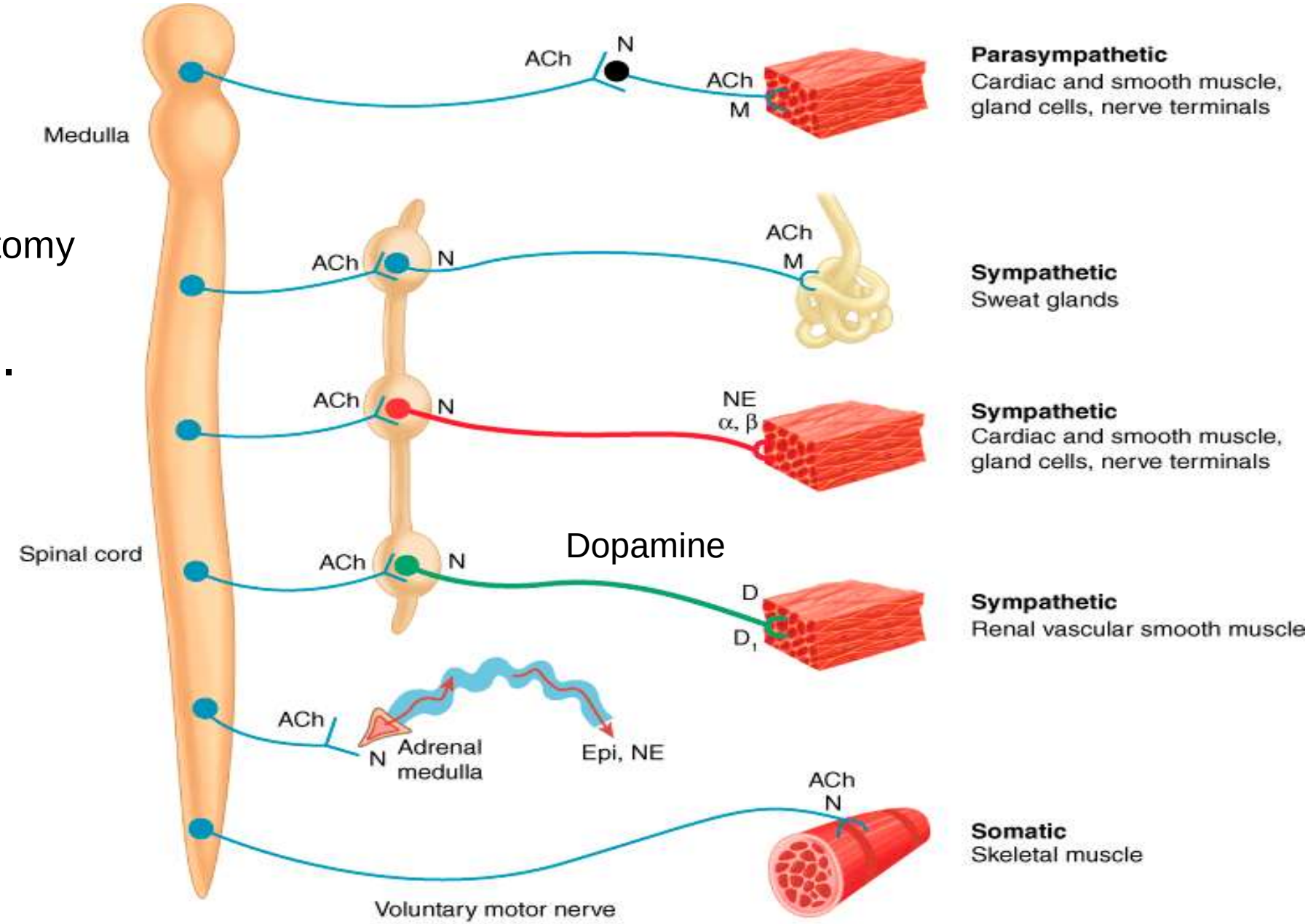
Acinar cells increase the secretion of saliva
Duct cells increase HCO_3^- secretion
increased blood flow to the salivary glands through vasodilation
Contraction of myoepithelium to increase the rate of expulsion of saliva
Overall, increased parasympathetic stimulation results in an increased flow of saliva that is more watery in composition.

→ Copious and watery secretion

* The chemical transmitter of parasympathetic fibers to salivary glands ? ACh
* The chemical transmitter of sympathetic fibers to salivary glands ? Noradrenaline

- Basal secretion.
- Special secretion. Under the effect of parasympathetic stimulation.

Anatomy of ANS.



Functions of Sympathetic Fibers

The stimulation of sympathetic fibers causes less secretion of saliva, which is thick and rich in mucus. It is because these fibers activate the acinar cells and cause vasoconstriction by secreting noradrenaline.

↳ of BVs

→ Scanty and viscous secretion

Reflex regulation of salivary secretion

Salivary secretion is regulated by nervous mechanism through reflex action. Salivary reflexes are of two types:

1- Unconditioned reflex

- Unconditioned reflex is the inborn reflex that is present since birth. It does not need any previous experience. This reflex induces salivary secretion when any substance is placed in the mouth. It is due to the stimulation of nerve endings in the mucous membrane of the oral cavity.

Examples include:

(1) When food is taken.
(2) When any unpleasant or unpalatable substance enters the mouth.
(3) When the oral cavity is handled with instruments by dentists.

2- Conditioned reflex

- Conditioned reflex is the one that it needs previous experience. Presence of food in the mouth is not necessary to elicit this reflex. The stimulus for this reflex is the sight, smell, hearing or thought of food. It is due to the impulses arising from eyes, nose, ears, etc.

EFFECTS OF DRUGS AND CHEMICALS ON SALIVARY SECRETION

Substances which Increase the Salivary Secretion

1. Parasympathomimetic drugs like acetylcholine, pilocarpine, muscarine and physostigmine.

3. Histamine.

Substances which Decrease the Salivary Secretion

1. Parasympathetic depressants like atropine and scopolamine.

(Parasympatholytics)

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Applied physiology

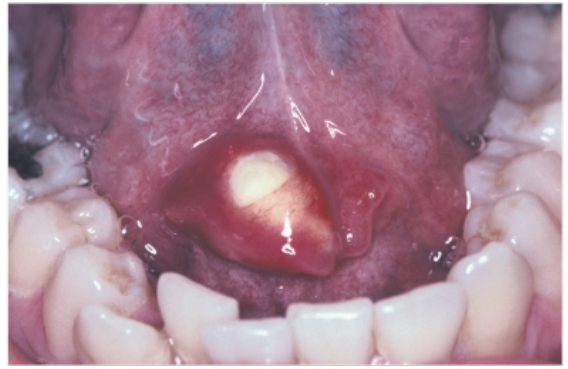
✓ Hyposalivation

Temporary hyposalivation occurs in:

- Emotional conditions like fear.
- Fever.
- Dehydration.

Permanent hyposalivation occurs in:

- Obstruction of salivary duct (sialolithiasis).
- Congenital absence or hypoplasia of salivary glands.



✓ Hypersalivation

Hypersalivation occurs in the following conditions:

- Tooth neoplasm (abnormal new growth or tumor) in mouth or tongue.
- Disease of esophagus, stomach and intestine.
- Neurological disorders such as mental retardation, cerebral stroke and parkinsonism
- Some psychological and psychiatric conditions.
- Nausea and vomiting

✓ **In addition to hyposalivation and hypersalivation, salivary secretion is affected by other disorders also which include the following.**

1- Xerostomia

Xerostomia means dry mouth. It is due to hyposalivation or absence of salivary secretion (aptyalism). The causes of this disease are:

- Dehydration or renal failure.
- Sjögren's syndrome (see below).
- Radiotherapy.
- Trauma to salivary gland or their ducts.
- Side effect of drugs like antihistamines, antidepressants drugs.
- Shock.
- After smoking marijuana (psychoactive compound from the plant cannabis).

Xerostomia causes difficulties in mastication, swallowing and speech. It also causes halitosis (bad breath).

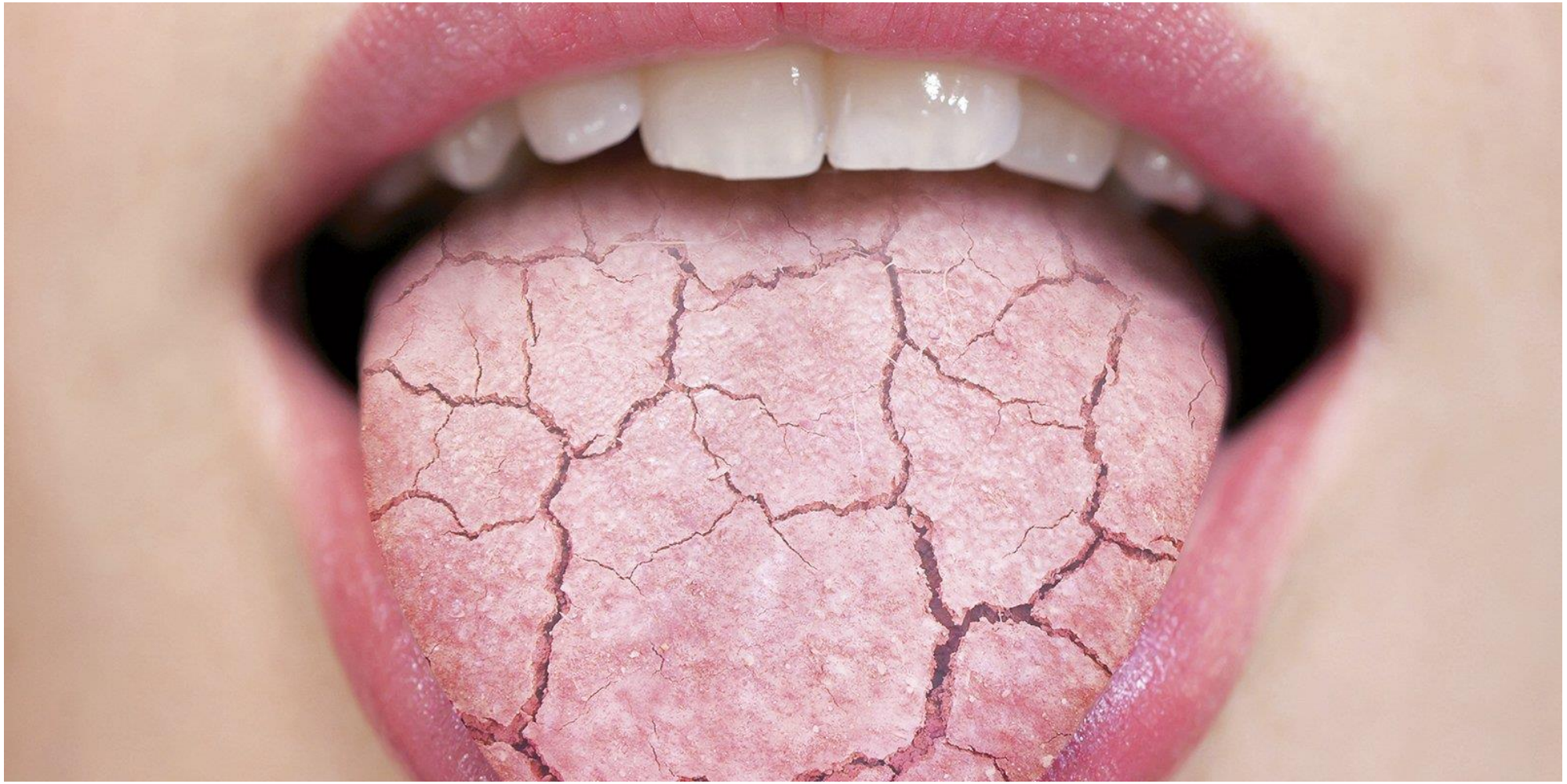


Image showing the mouth of a patient suffering from xerostomia.

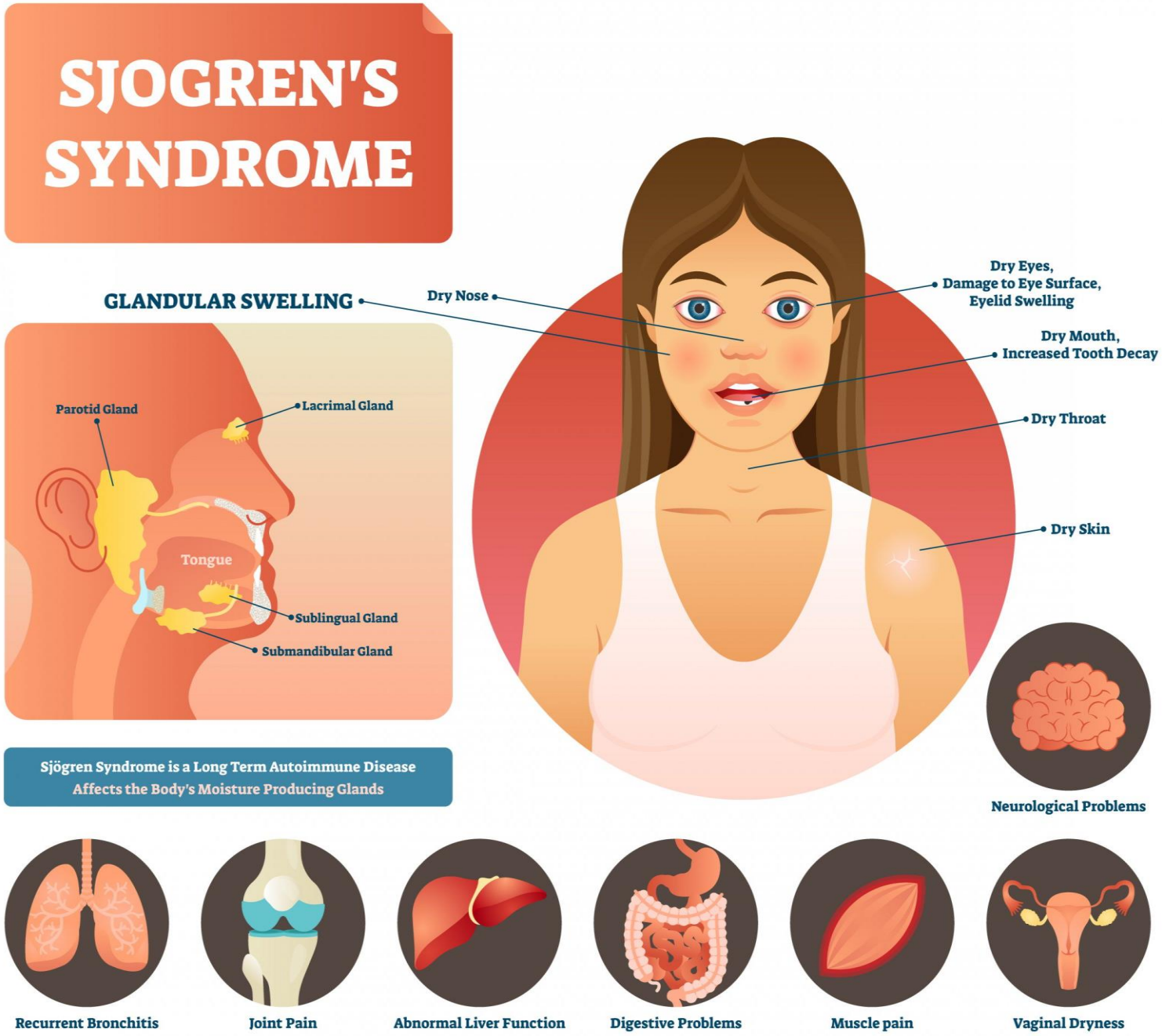
2- Mumps

Mumps is the acute viral infection affecting the parotid glands. The virus causing this disease is paramyxovirus. It is common in children who are not immunized. It occurs in adults also. Features of mumps are puffiness of cheeks (due to swelling of parotid glands), fever, sore throat and weakness.

3- Sjögren's Syndrome

- It is an autoimmune disorder in which the immune cells destroy exocrine glands such as lacrimal glands and salivary glands. Common symptoms of this syndrome are dryness of the mouth due to lack of saliva (xerostomia), persistent cough and dryness of eyes. In severe conditions, the organs like kidneys, lungs, liver, pancreas, thyroid, blood vessels and brain are affected.

Image showing the child patient suffering from mur



Useful links

https://www.youtube.com/watch?v=WqdtSQBWiBs

https://www.youtube.com/watch?v=Lrs7EiPsuSE

https://www.youtube.com/watch?v=52CMXCe2_CY